

# Conceptual Understanding, Procedural Fluency and Mathematical Mindset at the Grade 4 Level

## Report

### Project description.

It was the second time this PDIG was undertaken at the New Frontiers School Board. The first time, the targeted audience was Grade 6 teachers. The experience gained in the first PDIG allowed us to carry out the project almost completely as planned, with some adjustments, and may have allowed us to go a little further in one aspect. There were three primary goals that drove this project: streamlining the JUMP approach, clarifying the processes of conceptual development and procedural fluency, and introducing teachers to the notion of mathematical mindsets. A fourth was added as it was decided (based on the knowledge acquired from RTI) to establish the Essential Learnings of both grade levels of the cycle, grades 3 and 4.

At the onset, it was determined that establishing the Essential Learnings for both grades 3 and 4 would be beneficial to all involved. That activity went very well as teachers were finding common ground and understanding on what should be prioritized for which grade level. The act of collating the information also went well. Several teachers were new to the Google Doc service, but all enjoyed the collaborative process that ensued. Activities surrounding conceptual understanding were selected from JUMP and other sources. Finally, a greater understanding of the need to develop a positive mathematical mindset was presented. Teachers were appreciative of the opportunity to share and discuss their understanding of the development of mathematical mindsets, at times challenging their own preconceived notions, at times simply corroborating them. The idea that “all students can be good at math” supported by John Mighton in JUMP and reinforced by Jo Boaler in *Mathematical Mindset* seemed to be most challenging for some of the participating teachers.

I had not clearly understood the purpose behind the idea of journal entries. As such, they were all done by me and simply summarized what had taken place during the meeting, sometimes very briefly. Hence, the following will be more thorough and representative of the learning that occurred during each day.

During our first meeting day, teacher’s understanding of conceptual processes was challenged through a Concept Attainment activity that aimed to make them rediscover (or discover) the difference between conceptual understanding and procedural fluency. The next activity served to challenge their own conceptual versus procedural understanding of dividing a whole by a fraction. Both of these served to underline the importance of conceptual understanding, along with the need for procedural fluency, to attain mathematical proficiency. A parallel was later established with JUMP and how the activities found in the teacher guides, help to promote deeper understanding. Later, each teacher received a copy of *Mathematical Mindset* by Jo Boaler, and a reading schedule was established.

From this point on, every day started with a discussion of the chapters assigned. Good conversations followed that challenged teachers in their understanding and the importance of Conceptual Understanding in the learning of mathematics. On the second day, teachers received a copy of *Domino Games*, and were introduced to other resources available, including the DNA material. As we prepared to begin the process of collating the JUMP lessons, the Gizmo activities, and other selected activities to the Progression of Learning, teachers were shown how to access the Google docs. The organisation of the resources in one document was completed over the next 2 days, such that the project came to an end on April 6<sup>th</sup>. Teachers did not create the same number of sections as had been created in the Grade 6 PDIG. A final review of the document will be performed before being released to the other teachers.

### **Project goals and outcomes**

Our project consisted of five distinct goals: to align the JUMP content to the PoL; to identify the components of the lesson plans that enhance conceptual understanding and integrate DNA math activities; to identify and select the activities that best promote conceptual understanding; to identify the differences between conceptual understanding and procedural fluency, and use that knowledge to guide students in their learning; to develop a greater awareness as to how a mathematical mindset can be developed in elementary school children.

The document produced through Google docs is the end product of the first three goals of our PDIG. This document will be distributed to all members of the NFSB grade 4 community, along with *Domino Games* and *Deca Dice* books and manipulatives as prescribed by the document. The document produced will also be shared with the greater anglophone community through the LCEEQ.

The 4<sup>th</sup> and 5<sup>th</sup> goals, identifying the differences between conceptual understanding and procedural fluency, and how to develop a mathematical mindset in elementary school children, are elements that are less tangible to evaluate. The hope is that the professional conversations we had through the creation process and the discussions triggered by the reading of Jo Boaler's book, has impacted teachers in such a way as to open their eyes to their use of the teacher guides to improve conceptual understanding and development in their students. These goals appear to have been met in part due to the feedback provided by some members throughout the PDIG; however, it will only be possible to determine if there is any lasting effect with continued conversations and visits to the teacher's classrooms themselves.

### **Reinvestment**

The document produced uses the progression of learning as its foundation. First, it divides the curriculum into Essential Learnings according to the two grade levels targeted, grade 3 and grade 4. Teachers then correlated the JUMPmath lessons to the progression. This serves to identify any gaps that exist between the Progression and the

material provided through the JUMPmath approach, and enables teachers to clearly see where, if any, supplemental teaching resources are required to cover the curriculum. The teachers also correlated the Application Questions provided through MaST to the lessons and the Progression. Finally, a list of activities (JUMP activities, Gizmos, and other sources) was added to enable the teachers to have quick access to greater conceptual development activities.

This document can be used by the greater anglophone community even if they do not use JUMPmath. Should they use another approach, it would be possible for them to erase the content of the column labeled JUMP to incorporate their own material. The rest of the content of the document, given that the Progression of Learning is its foundation, could be used by any teacher teaching math in the province.

As this was a repeated PDIG, we had a similar PDIG for Cycle 3 in 2016-2017, it would be of great importance to repeat it with the only cycle for which this has not been done, cycle 1. This final PDIG would combine the best of both PDIG's. In the first PDIG, the document generated included two extra sections not found in the grade 4 document due to time. One section listed the activities selected, while the other provide the activities themselves. In the cycle 2 PDIG, the Essential Learnings were included, which was not done in the grade 6 model. By combining both of these elements, the produced document would receive much added value.